

## EFFECT OF WEED COMPETITION PERIOD ON YIELD AND YIELD COMPONENTS OF WHEAT

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### ABSTRACT

Weeds competition in wheat (*Triticum aestivum*) crop was investigated at Adaptive Research Farm, Gujranwala during rabi, 2003-2004 and 2004-2005. The treatments comprised weed competition with crop for first 30, 40, 50, 60, 70, 80, 90, 100, 110 days and full season. Weed infestation periods significantly affected fresh and dry matter weight of weeds, number of tillers per square meter, number of grains per spike, 1000-grain weight and grain yield. The highest grain yield (5.06, t/ha) was recorded in the plots where weeds were removed after 30 days followed by 40 days (4.96 t) and 50 days after sowing (4.85 t). However, these yields were at par with each other. When weeds were allowed to grow beyond 50 days after sowing a significant reduction in grain yield and yield components was noted, but fresh and dry weight of weeds were increased significantly. Full season weed infestation caused 47.95 percent reduction in grain yield as compared to 30 days weed infestation. Critical period of weed-crop competition was determined between 30-50 days after sowing of wheat.

**KEYWORDS:** *Triticum aestivum*; weed control; agronomic characters; Pakistan.

### INTRODUCTION

To obtain maximum wheat yield weeds should be controlled at proper time in right manner. It is very important to determine the critical period of weed-crop competition to plan effective weed control. There may be some periods when weeds must be removed and some other periods when these may be allowed to grow, as these do not cause any pronounced harm to the crop. This is the most useful information required for proper weed control.

Lot of literature on this subject shows that beginning of growing cycle is crucial in determining the intensity and outcome of subsequent weed-crop competition. It also appears that in hotter climates where life span of wheat crop is often shorter, importance of early weed-crop competition is

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accentuated. Grain and straw yield decreased significantly when the weeds competed with crop for full season (10). The wheat yield was not influenced significantly when crop was kept weed free for six weeks after planting or when crop became 6-10 weeks old. Shad *et al.* (12) reported that duration of critical weed-crop competition in wheat extends from seven to ten weeks after sowing. Rajput *et al.* (8) established that allowing weeds to grow in wheat crop upto 30 days did not show any adverse effect on growth and yield of wheat. However, plant height, number of tillers per square meter, number of grains per spike, 1000-grain weight and grain yield were significantly reduced due to presence of weeds in wheat crop beyond this duration. Weed removal after 75 days was found uneconomical. The critical weed crop competition period was observed to be 4 to 8 weeks after sowing of crop (11).

Ghafoor and Sadiq (4) recorded 29 and 30 percent reduction in wheat grain yield in first and second year, respectively by full season competition with *Phalaris minor* at a density of 200 plants per square meter. Grain yields obtained in the plots where weeds were removed after 4 and 6 weeks of crop emergence were as good as full season weed-free plots. Ibrahim *et al.* (6) reported that presence of weeds in wheat throughout growth period caused 23-30 percent reduction in grain yield.

It has been reported that with production of each kilogram of weed, one kilogram wheat grains are reduced (9). Hall *et al.* (5) concluded that for most of field crops it is unnecessary to control weeds in first few weeks after crop and weed emergence. El-Hamid *et al.* (3) and Singh *et al.* (13) reported that weed free period for first 60 days after sowing gave similar results as of weed free till harvesting.

Akhtar *et al.* (1) found that weed biomass and N uptake by weeds increased with increased N levels and competition duration, while weed population was not affected significantly. On the other hand, yield and yield parameters of wheat decreased with an increase in weed crop competition duration. Ali *et al.* (2) noted significant effect of weed competition duration on growth and yield components of wheat. Maximum grain yield (6122.21 kg/ha) was recorded in weed free plots followed by 4 and 6 weeks competition which differed significantly from weed free plots. Khan *et al.* (7) reported that weed infestation periods significantly affected plant height, spike length, number of spikes per square meter, 1000 grain weight, biological yield and grain yield. Although weed competition for first 42 days did not reduce the yield significantly. Yet after this period weed infestation showed adverse effect on yield components. The present studies were conducted to determine critical period of weed-crop competition in wheat crop in rice tract.

## MATERIALS AND METHODS

These studies were conducted at Adaptive Research Farm, Gujranwala during Rabi 2003-2004 and 2004-2005. Layout system was RCBD with three replications. Crop was sown with tractor drawn rabi drill having a plot size of 5 x 10 meter and row to row distance of 22.50 cm (cv. Inqalab-91). Crop was sown on November 01 during 2003-2004 and November 06 during 2004-2005, using a seed rate of 125 kg per hectare. All other agronomic practices were kept normal and uniform for all the treatments.

Weeds were allowed to compete with the crop for different periods i.e. 30, 40, 50, 60, 70, 80, 90, 100, 110 days after sowing and full season. After designated periods of competition, plots were kept weed free for rest of the season. Fresh weight of weeds was recorded after removing weeds manually from randomly selected three places with a quadrant measuring one meter square. Dry weight was recorded after drying the samples in an oven at 70°C for 48-hours. Other parameters i.e. number of grains per spike, 1000-grain weight, number of tillers per square meter and grain yield were recorded using standard procedures.

Data collected were analyzed statistically by using Fisher's analysis of variance techniques and LSD test was applied at 5 percent probability level to compare treatment means (14).

## RESULTS AND DISCUSSION

### Fresh and dry weight of weeds

The data (Table) revealed that weed competition for first 50 days had no significant effect on fresh and dry matter weight of weeds. However, weed infestation period beyond 60 days increased the fresh and dry matter weight significantly. Minimum fresh (48.46 g) and dry (10.56 g) matter weight of weeds were recorded in the plots where weeds were allowed to remain for first 30 days. Maximum fresh and dry biomass weight (1704.29 and 381.76 g) was obtained from full season weedy check plot. As duration period of weed crop competition increased, fresh and dry matter weight of weeds were also increased. These results agreed to the findings of Rao (9) and Akhtar *et al.* (1).

### Number of productive tillers per square meter

Various weed competition treatments produced significant effect on number of productive tillers (Table 1). Maximum number of tillers were recorded from the plots with 30 days ( $398.50/m^2$ ), 40 days ( $397.17/m^2$ ) and 50 days ( $394.00/m^2$ ) crop weed competition and these were at par statistically. However, weed infestation period beyond 60 days caused significant decrease in number of productive tillers. Weed control adopted after 80 days of crop sowing did not show significant increase in number of tillers as compared to full season weed competition. Yield reduction is also due to poor tiller findings (1, 2, 4, 7, 8).

### **Number of grains per spike**

Number of grains per spike differed significantly in various periods of weed competition (Table). Maximum grains (50.25/spike) were recorded in plots where weeds infestation remained for 30 days after sowing followed by 49.43, 49.17 and 48.36 grains per spike in case weeds allowed to grow for 40, 50 and 60 days, respectively. All these treatments did not differ significantly from each other. However, minimum grains per spike (42.14) were recorded in full season weedy plots. Earlier researchers (1, 2, 8, 13) reported similar findings.

### **1000-grain weight**

Weed crop competition had also significant effect on 1000-grain weight (Table). Weed competition for first 50 days had no significant effect on 1000-grain weight. Maximum 1000-grain weight (45.18 g) was noted in 30 days weed competition while it was minimum in full season weed competition (37.97 g). After 50 days weed competition, 1000-grain weight significantly decreased and it may also be noted that difference in 1000-grain weight occurred at prolonged periods of weed competition. These results agree to previous findings (1, 2, 4, 7, 8).

### **Grain yield**

The data (Table) show that all weed-crop competition treatments had a significant effect on grain yield. Presence of weeds in wheat for more than 50 days after sowing badly affected the grain yield. Maximum grain yield (5.06 t/ha) was recorded in plots which were infested with weeds only for first 30 days after sowing, although it was at par with the plots infested with weeds

Table Grain yield and yield components of wheat as affected by weeds competition duration (pooled data of rabi 2003-04 and 2004-05)

Treatments	No. of weeds/m <sup>2</sup>	Fresh weight of weeds (g)	Dry weight of weeds (g)	No. of tillers/m <sup>2</sup>	No. of grains/spike	1000-grain weight (g)	Grain yield (t/ha)	Increase over check (%)
Weeding after 30 days of crop sowing	191.00	48.46g	10.65f	398.50a	50.25a	45.18a	5.06a	47.95
Weeding after 40 days of crop sowing	171.34	87.75g	15.56f	397.17a	49.43a	44.65a	4.96a	45.03
Weeding after 50 days of crop sowing	168.83	202.21fg	30.08f	394.00a	49.17a	44.04a	4.85a	41.81
Weeding after 60 days of crop sowing	170.67	370.00f	41.70ef	386.67ab	48.36a	42.32b	4.49b	32.75
Weeding after 70 days of crop sowing	172.00	608.39e	63.91de	374.17b	45.59b	42.18b	4.35bc	27.19
Weeding after 80 days of crop sowing	193.33	898.72d	86.32d	363.83bc	45.48bc	41.48bc	4.16cd	21.64
Weeding after 90 days of crop sowing	179.17	1254.33c	134.63c	349.67c	44.69bc	40.99bc	3.94de	15.20
Weeding after 100 days of crop sowing	198.67	1438.84b	164.95c	343.83c	43.63cd	40.00cd	3.75ef	9.65
Weeding after 110 days of crop sowing	179.00	1570.41ab	261.29b	342.17c	43.10d	39.80cd	3.57f	4.39
No weeding till harvest	176.83	1704.29a	381.76a	338.50c	42.14d	37.97d	3.42f	-
LSD<0.05		176.055	31.203	14.356	1.930	2.105	0.288	-

Means in a column followed by different letters significantly differ (P&lt; 0.05) using LSD test.

for 50 days. Further weeds infestation period decreased the yield significantly. However, in case 90 days weed competition yield did not differ significantly as compared to 100 and 110 days weed competition and full season weedy check. Minimum yield (3.42 t/ha) was recorded in the plots where weeds were allowed to grow for full season.

The critical period of weed-crop competition was observed between 30-50 days after crop sowing. Weeds were allowed to grow after 50 days or more caused a significant reduction in yield and yield components. Therefore, weeds must be controlled within 50 days of crop sowing. These results agree to earlier findings (1, 2, 4, 6, 7, 8, 9, 10).

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